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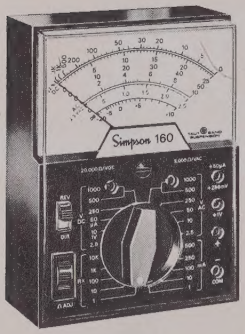
OPERATOR'S MANUAL

SIMPSON MODEL 256
VOLT-OHM-MILLIAMMETER

SIMPSON ELECTRIC COMPANY
5200 W. Kinzie St., Chicago, Illinois 60644
Area Code 312, Telephone 379-1121
In Canada, Bach-Simpson Ltd., London, Ontario

new VOM's from Simpson



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Just 3 5/16" Wide . . .
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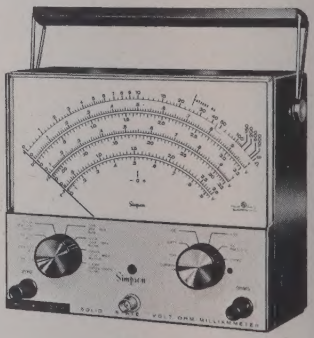
- 5 Resistance Ranges . . . Plus a 0-250 DC Millivolt Range



313 Solid-State VOM

VTVM Features . . . VOM Conveniences

- Uses a single 9-volt battery
- 10 Meg Ω DC . . . 11 Meg Ω AC
- Large 7" scale

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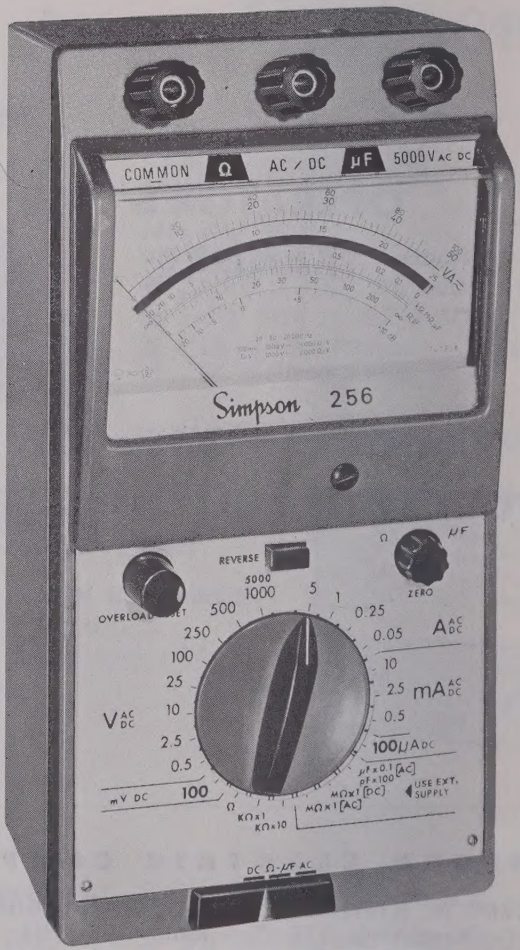

FIGURE 1. SIMPSON MODEL 256

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SECTION I
SPECIFICATIONS

A. Accuracy

Current and Voltage Ranges

DC Ranges: ±1% of Full Scale
AC Ranges: ±1.5% of Full Scale
5000V. AC & DC ±2.5% of Full Scale

Resistance and Capacity Ranges

Ω x 1:	±1	Degree of Arc
KΩ x 1:	±1	Degree of Arc
KΩ x 10:	±1	Degree of Arc
MΩ x 1 DC:	±1	Degree of Arc
MΩ x 1 AC:	±1.5	Degree of Arc
Capacity:	±1.5	Degree of Arc

B. DC Volts

Sensitivity: 25,000 Ω per volt
Ranges 0-100 Millivolts
0-0.5-2.5-10-25-100-250-500-1000 V
0-5,000 V; Sensitivity = 5,000 Ω /volt

C. AC Volts

Ranges and Sensitivity 0-10-25-100-250-500-1000 V
Sensitivity = 2,000 Ω /volt

0-0.5 V
Sensitivity = 100 Ω /volt

0-2.5 V
Sensitivity = 400 Ω /volt

0-5,000 V
Sensitivity = 2,000 Ω /volt

D. DC Current 0-100 Microamperes
0-0.5-2.5-10 Milliamperes
0-0.05-0.25-1-5 Amperes

E. AC Current 0-0.5-2.5-10 Milliamperes
0-0.05-0.25-1-5 Amperes

Specifications

F. Resistance Ranges

	Center	
Ω x1	30 Ω	0-200 Ω
KΩ x1	1 KΩ	0-50 KΩ
KΩ x10	10 KΩ	0-500 Ω
MΩ x1 DC	1 MΩ	0-50 MΩ *
MΩ x1 AC	1 MΩ	0-50 MΩ **

G. Capacity ranges

pF x 100	100 pF - 20,000 pF**
uF x 0.1	2,000 pF - 5 uF**

*With external DC voltage supply which may be any voltage between 100 and 130. See Resistance Measurement, Section III.

**With external AC voltage supply, which may be any voltage between 100 and 240, 60 HZ. See Resistance Measurement, Section III.

H. Audio Output Voltage

Sensitivity	2,000 Ω /volt, with 0.1 uF internal
Ranges	DC blocking capacitor
	0-10-25-100-250 V.A.C.

I. Frequency Effects

Maximum additional errors due to frequency effects are:

AC Voltage Ranges

	25 HZ - 10 KHZ.	10 KHZ - 20 KHZ.
0-0.5 V.A.C.	1.5%	3%
0-2.5 V.A.C.	1.5%	3%
0-10 V.A.C.	1.5%	3%
0-25 V.A.C.	1.5%	3%
0-100 V.A.C.	1.5%	3%
0-250 V.A.C.	1.5%	3%
0-500 V.A.C.	1.5%	3%

	25 HZ - 1.5 KHZ.
0-1000 V.A.C.	3%

AC Current Ranges

		25 HZ - 10 KHZ.	10 KHZ - 20 KHZ.
0-0.5	Ma.A.C.	1.5%	3%
0-2.5	Ma.A.C.	1.5%	3%
0-10	Ma.A.C.	1.5%	3%
0-0.05	A.A.C.	1.5%	3%
0-0.25	A.A.C.	1.5%	3%

		25 HZ - 1.5 KHZ.
0-1	A.A.C.	3%
0-5	A.A.C.	3%

J. Temperature Effects

The Simpson 256 is calibrated at 20° Centigrade (68° Fahrenheit.)

At temperatures other than 20° C (68°F) a small error will be present.

On the DC ranges, for each 10° C temperature change from 20°C, there will be an additional error not exceeding 0.8% of the indicated value. This holds true between 0°C and 50°C only.

On the AC ranges, for each 10°C temperature change from 20°C, there will be an additional error not exceeding 2.5% of the indicated value. This holds true between 0°C and 50°C only.

K. Circuit Loading

1. DC Voltage Ranges — Internal Resistance

5,000.0	V.	25.0	MΩ
1,000.0	V.	25.0	MΩ
500.0	V.	12.5	MΩ
250.0	V.	6.25	MΩ
100.0	V.	2.5	MΩ
25.0	V.	625.0	KΩ
10.0	V.	250.0	KΩ
2.5	V.	62.5	KΩ
0.5	V.	12.5	KΩ
100.0	mV.	2.5	KΩ

Specifications

2. AC Voltage Ranges	Internal Resistance
5,000 V.	25 MΩ
1,000 V.	2 MΩ
500 V.	1 MΩ
250 V.	500 KΩ
100 V.	200 KΩ
25 V.	50 KΩ
10 V.	20 KΩ
2.5 V.	1 KΩ
0.5 V.	50 Ω

3. DC Current Ranges	Voltage Drop at F.S.
5A.	0.6 V.
1A.	0.45 V.
0.25A.	0.3 V.
0.05A.	0.3 V.
10mA.	0.3 V.
2.5mA.	0.3 V.
0.5mA.	0.3 V.
100uA.	0.2 V.

4. AC Current Ranges	Voltage Drop at F.S.
5A	0.6 V.
1A	0.45 V.
.25A	0.3 V.
0.05A	0.3 V.
10mA	0.5 V.
2.5mA	0.2 V.
0.5mA	0.5 V.

5. Resistance Ranges	Max. Current*	Max. Voltage*
Ω	13.5 mA	0.35V
KΩ x1	1.5 mA	1.5V
KΩ x10	0.15 mA	1.5V
MΩ x1 DC	0.13 mA	100 to 130 V.D.
MΩ x1 AC	0.24 mA	100 to 240 V.A.

6. Capacity	Max. Voltage*
pF x 100	240V.A.C.
uF x 0.1	240V.A.C.

*This is the maximum current or voltage that will appear at circuit or component being measured.

SECTION II
GENERAL DESCRIPTION

The Simpson 256 is an accurate, compact, and easy to operate Volt-Ohm-Milliammeter. Accurate measurement of DC and AC voltage, DC current, resistance, decibels and capacitance can be made.

The Simpson 256 is extremely rugged and incorporates a protection circuit to prevent damage in the event of accidental overload. This circuit is not dependent on any battery supply, and therefore is always operational.

The Model 256 uses the most modern components, with printed circuit boards to take considerable abuse and still provide accurate indications. If it is kept clean and is not subjected to extreme shock or continuous vibration, the Model 256 will give many years of trouble free service.

The Model 256 features a taut band suspension movement, with a sloping dial for easy viewing, and an anti-paralax mirror for accurate readings. It also provides a linear scale for both AC and DC measurements. The basic movement sensitivity is 40 microamperes.

IIA OVERLOAD PROTECTION

With the exception of the voltage ranges of 100V and higher, all the ranges are protected against inadvertent overload damage by a unique protection system. The instrument contains a sensitive overload relay, which disconnects the common input jack when an overload exceeds approximately 20 times the

normal full scale current or voltage of the range in use. In usages other than current or voltage measurement, the overload relay functions internally at approximately 20 times the basic instrument sensitivity of 40 microamperes. This current is well within the safety limits of the tester components and D'Arsonval movement. The overload relay is not dependent on any battery supply, and is operational at all times.

The 256 has an almost perfect overload protection system. In almost any accidental overload, no damage to the 256 will result. However, in some cases care must be exercised by the user. For example: on the 100 V range, the overload relay will not function unless the applied voltage exceeds the previously stated 20 times normal full scale value, which on the 100V range will be about 2,000V. On the 500V, 1,000V, and 5,000V ranges severe over normal voltages are required to actuate the protection relay. Therefore, as stated in Section IIIB. of this manual, the 256 must not be connected to a voltage exceeding 1,000V., except on the 5,000V. range, where the maximum is 5,000V.

IIB DIODE PROTECTION

In the Model 256 protection diodes are wired directly across the moving coil of the D'Arsonval movement. These diodes shunt excess currents, and react instantly to overloads.

IIC FUSE PROTECTION:

A fuse, in series with the AC/DC input banana jack protects the 5 ampere range and internal wiring. This fuse protection is in addition to the overload relay and the instrument diodes. Since high currents may be encountered if the "Ω x 1" or current ranges are overloaded, it is possible that this fuse may blow, in addition to the opening of the relay contacts. The tester will be inoperative until the fuse is replaced.

IID REVERSE SWITCH:

A push-button switch is provided for reversing DC polarity of the instrument. This switch is for use *only* on DC ranges.

IIE INTERNAL CURRENT TRANSFORMER

An unusual feature of the 256 is an internal current transformer. This transformer does not affect DC operation of the 256. However it enables the 256 to provide a new and unmatched ability to measure and separate AC and DC currents and voltages. An example of this is as follows: In typical transistor auto radios, the output stage consists of a power transistor, to drive the loudspeaker. The collector current of the transistor consists of a DC component, and an AC signal audio component. This is comparable to the situation in a conventional vacuum tube amplifier, where there is a DC plate voltage and an AC signal (audio) voltage.

With the 256 set to measure DC current, the DC collector current is indicated. Now, with the power for the radio turned OFF, set the 256 function switch to AC. With the power for the radio turned on, the instrument will not respond to the DC current, but will read the value of the AC (audio) current. In a similar manner, the collector voltages, DC and AC (audio) can be measured.

Detailed instructions for this mode of operation are shown in Section III of this manual.

IIF CAPACITANCE MEASUREMENT:

The Simpson 256 has a direct reading capacitance scale. Directions for use are detailed in the instruction section of this manual.

IIG FRONT PANEL:

The Simpson 256 is an easily read instrument with a large clear dial face. All switch positions, banana jacks and operating controls are clearly labeled. Locations are shown in Figure 3.

IIH RANGE SWITCH:

The range switch in the center of the lower part of the front panel has 24 positions. It may be turned in either direction to obtain any desired range. When selecting a DC, AC, or Ω Ca-

pacity range, the FUNCTION SELECTOR must also be switched to DC, AC, or Ω C, to match the desired range selection.

II I "ZERO Ω uF" ADJUSTMENT:

The control at the upper right on the panel is used for adjusting pointer deflection in resistance and capacity ranges. Details of usage are shown in instruction portions of this manual.

IIJ CIRCUIT JACKS:

There are five circuit jacks. These are the connection points for the test leads. See Fig. 3 for locations, and Fig. 2 for test lead details.

The "Common-"jack is located at the upper left corner of the 256. The "AC/DC" jack is at the upper center. These jacks are used for most DC voltage and current, AC voltage and current, and DB reading.

CAUTION HIGH VOLTAGE:

The jack in the upper right corner is for 5,000 volts only.

On the rear wall of the tester, two jacks will be found. These are identified on the strip label at the top of the tester as the "Ω " and "uF" jacks.

These jacks are used for resistance, capacity and output voltage measurement.

IIK RESETTING THE TESTER AFTER AN OVERLOAD:

The reset button normally extends about 1/4" from the panel. If an overload causes the relay to trip, the button will pop up and extend about 1/2" from the panel. Before re-setting the relay, make certain that the cause of the overload is found and corrected. To reset the relay, press down on the button and the relay will "click" into position. Do not forcibly hold the reset button down while an overload condition is present.

IIL TESTER CASE:

The Simpson 256 is housed in a rugged plastic case. It is molded with heavy walls for maximum durability. All the components are attached or mounted to the front panel. The entire instrument slips into and out of the case in one piece after removal of battery, and holding nuts.

IIM PRINTED CIRCUIT:

Conforming to the latest developments, almost all the component parts are mounted on a printed circuit board. This reduces maintainance, and extends the useful life of the instrument.

IIN TEST LEADS:

Each 256 is furnished with one pair of 4-1/2' long test leads, finely stranded for flexibility. One lead has red, and one has grey, terminations for identification. One end has a plastic insulating skirt, intended primarily for use at the instrument jackposts. The other end has a spring tip, to which either a test probe or clip, furnished with each lead set, may be attached. SEE FIG. 2A and 2B.

When using the "Ω" or "uF" jack, a different test lead procedure is necessary. The "tip" end of the test lead is inserted into the jack. The end of the test lead with the plastic insulating skirt is used, by attaching either the test probe or alligator clip.

IIO TEST LEAD INSPECTION:

Periodic inspection of the test leads is recommended to detect cuts, burns, or other damage that could reduce the insulation strength of the leads. When replacement is necessary, order the Cat. #07541 Simpson Test Leads.

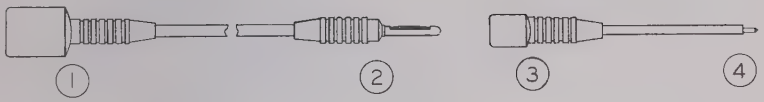


FIGURE 2A

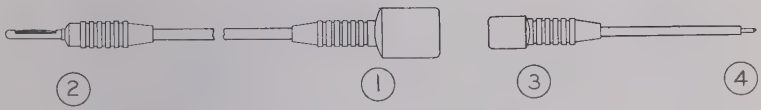
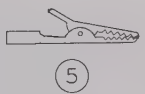


FIGURE 2B



1. INSULATING SKIRT
2. TEST LEAD TIP
3. TEST PROBE RECEPTACLE
4. TEST PROBE TIP
5. ALLIGATOR CLIP

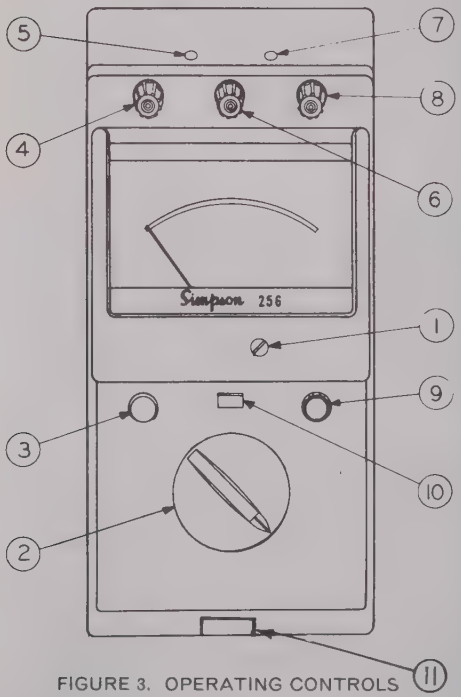
FIGURE 2. TEST LEADS

SECTION III
OPERATING INSTRUCTIONS

III. A. OPERATING CONTROLS

This outline drawing shows the location of operating controls and test lead jacks. Jacks "Ω" and "uF" are located on the rear wall of the case.

OPERATING CONTROLS



1. Pointer Zero Adjust
2. Range Selector
3. Overload Reset
4. COMMON-Jack
5. Ohms Jack
6. AC/DC Jack
7. uF Jack
8. 5,000 V. AC DC Jack
9. Zero Adjust, Ω, uF.
10. DC Polarity Reversing Switch
11. Function Switch

FIGURE 3. OPERATING CONTROLS

III. B. GENERAL PROCEDURES

1. Before using the instrument, the pointer should indicate zero. If necessary, use the zero adjust screw to set the pointer to zero.

   The most accurate readings are obtained with the tester in the horizontal position.

2. Before using the instrument be sure that the Overload Reset Button is in the "ON" position. If there is any doubt, press down on the button. If the switch is not "ON" it will "click" into "ON" when pressed.

   If an overload condition of a serious nature occurs, the overload relay will disconnect the tester and release the reset button.

CAUTION

Do not use the overload reset button until the cause of the overload has been removed!! Do not defeat the overload system by forcibly holding the button down while the overload continues.

Except on the 5,000V range, the 256 must not, under any circumstances, be connected to a voltage greater than 1,000 volts, either AC or DC. The overload relay will function at about a 20 times overload in any case, but for example, on the 100 volt range this would require a voltage of about 2,000 volts. Since the relay requires about 0.01 seconds to open the circuit, excessive high voltage might damage the interior parts of the 256.

On the 5,000V range, do not apply a voltage greater than 5,000V, AC or DC.

3. The test leads supplied with your Simpson 256 are specially designed for use with this instrument. These leads match the 256 Jack Receptacles, and will give long service. When replacement is required, order Simpson test leads, Cat. #07541.

   Ordinary test leads may not fit properly into the 256 Jacks. In an emergency, ordinary test leads may be used, but should be promptly replaced by the correct type.

4. The function switch must be set to the desired position before the test leads are connected to the circuit under test. In any case, do not move the function switch while voltage or current is applied to the tester.

5. Set the range selector to a range whose full scale value is greater than the value to be measured.

6. If test lead connections are made in the wrong polarity, press the polarity reverse switch.

USE THE REVERSE BUTTON ON DC RANGES ONLY.

CAUTION

Always turn power Off while attaching test leads to circuits under test. Since pilot lights, switches, bleeder resistors, etc. can fail, treat any circuit as if power is present until the situation is proven to be safe. This precaution is important for your personal safety.

7. Do not use the Simpson 256 to measure circuits, where large peaks or spikes are present. As an example, high amplitude peaks are generated in the horizontal system of television receivers. These peak voltages can cause internal arcing and flashovers.

   If an overload occurs which is not large enough to operate the overload relay, the instrument should be disconnected promptly. Severe SHORT TIME overloads will not cause damage, but an overload, if permitted to remain for a long period of time, may overheat components of the instrument. Any long time overload must not exceed two times normal full scale value.

   Special care must be taken to avoid applying a DC overload to the 256 when the instrument is set up for AC operation. Because of the normal characteristics of the current transformer, a DC voltage or current which rises gradually from a small initial value to a very high value, regardless of how large a final value, will not operate the overload relay. This occurs only when the 256 is set for AC, but will not harm the 256 if precautions in the preceeding paragraph are followed.

A DC overload of at least 40 times the value of the AC range will operate the overload relay, if it is applied suddenly, rather than as a slow buildup.

8. A severe mechanical shock may cause a false opening of the overload relay. If this occurs, simply press the reset button. Rough handling, in any case, is to be avoided.

9. When measuring resistance it is helpful to know the polarity of the test leads.

   On the "Ω" range the "Common-" jack is at negative polarity.

   On the "KΩ x1" and "KΩ x100" ranges the "COMMON-" jack is actually at a positive polarity.

   On the "MΩ x1 DC" range, see Fig. 4 for lead polarity.

   Test lead polarity is not important when measuring passive devices such as resistors. If a circuit contains semiconductors, which have different forward and backward resistance, circuit resistance readings can be misleading. To determine whether circuit semiconductor components are affecting resistance measurements, take a second resistance reading with test clips or prods reversed. (The "Reverse" button is not to be used here.) If the two readings are not identical, disconnect the circuit components which are involved, to obtain a true reading. The "apparent" resistance of semiconductors may vary, as various resistance ranges are used. This is normal, and is the result of the nonlinear nature of most semiconductors.

III. C. DC VOLTAGE MEASUREMENT, 100mV RANGE TO 1,000V RANGE.

1. Connect the grey test lead to the "COMMON-" jack, and the Red test lead to the "AC/DC" Jack. (See Section II, Para. M).

2. Select the desired DC voltage range from the high range of 1000V, down to the 100mV range. This selection is made by using the range selector switch.

3. Set the function Switch to DC.

CAUTION

If high voltage is present in the circuit, turn power OFF while attaching test leads.

4. Connect the grey test lead to the negative side of the circuit to be measured and the red test lead to the positive side of the circuit.

5. Turn on the power in the circuit to be tested. If the pointer deflects to the left of zero, the anticipated polarity is opposite the actual circuit polarity. Turn off the power in the circuit which is being tested. Press the reverse button, or correct the test connections.

6. Read the voltage on the scale arc marked "VA, AC-DC".

7. For the 100mV, 10V, 100V and 1,000V ranges use the 0-100 numbers on the arc.

8. For the 0.5V, and 500V ranges use the 0-50 numbers on the arc.

9. For the 2.5V, 25V, and 250V ranges use the 0-25 numbers on the arc.

10. Use suitable multipliers for each range as required.

III. D. DC VOLTAGE MEASUREMENT, 5,000V RANGE.

CAUTION

DANGER!!! Do not touch circuit, instrument or test leads with power on!!

1. To use the 5,000 volt range, connect the grey test lead to the "COMMON-" Jack, and the red test lead to the "5,000V" jack. Turn the Range Selector Switch to the 5,000V position.

2. Set the function Switch to DC.

3. Be sure power is off in the circuit to be measured and all capacitors have been discharged: connect the grey test lead to the negative side of the circuit to be measured and the red test lead to the positive side of the circuit.

4. Turn on the power in the circuit. DO **NOT** touch the instrument or test leads. If the pointer deflects to the left side of zero, the anticipated polarity is opposite the actual circuit polarity. Turn off the power in the circuit being tested. DO NOT USE POLARITY REVERSE BUTTON. Correct the test lead connections, as required.

5. Read the voltage on the scale arc marked "VA AC-DC". Use the 0-50 numbers. Multiply the reading by 100.

6. Turn off the power before disconnecting the test leads.

III. E. DC CURRENT MEASUREMENT, 100 uA RANGE, TO 5A RANGE.

1. Connect the grey test lead to the "COMMON-" jack, and the red test lead to the "AC/DC" jack.

2. Select the desired DC current range from the high range of 5A., down to the low range of 100 uA.

CAUTION

Connect the 256, when used as a current measuring instrument, in series with the lead. DO NOT connect it to a voltage source, because such a connection could deliver excessive current to the 256.

CAUTION

If high voltage is present in the circuit, turn power OFF while attaching test leads.

3. Connect the grey test lead to the negative side of the circuit to be measured and the red test lead to the positive side of the circuit.

4. Turn on the power in the circuit to be tested. If the pointer deflects to the left of zero, the anticipated polarity is opposite the actual circuit polarity. Press the reverse button, or correct the test lead connections.

5. Read the current on the arc marked "VA, AC-DC". For the 100uA, 10mA, and 1A ranges, use the 0-100 numbers on the arc.

6. For the 0.5mA, 0.05A, and 5A ranges use the 0-50 numbers on the arc.

7. For the 2.5mA, and 0.25A ranges, use the 0-25 numbers on the arc.

8. Use suitable multipliers for each range, as required.

III. F. AC VOLTAGE MEASUREMENT, 0.5V RANGE TO 1,000V RANGE.

1. Connect the grey test lead to the "COMMON-" jack, and the red test lead to the "AC/DC" jack. (see Section II, Para. M).

2. Select the desired voltage range from the high range 1000V, down to the 0.5V range. This selection is made by using the range selector switch.

3. Set the function Switch to AC.

CAUTION

If high voltage is present in the circuit, turn power OFF while attaching test leads.

4. Connect the grey test lead to the low voltage side of the voltage to measured, and the red lead to the high voltage side.

5. Turn on the power in the circuit to be tested. The instrument will read the R.M.S. value of a sinusoidal wave form AC voltage.

6. Read the voltage on the scale arc marked "VA, AC-DC". For the 10V, 100V and 1,000V ranges use the 0-100 numbers of the arc.

7. For the 0.5V, and 500V ranges use the 0-50 numbers on the arc.

8. For the 2.5V, 25V, and 250V ranges use the 0-25 numbers on the arc.

9. Use suitable multipliers for each range as required.

III. G. AC VOLTAGE MEASUREMENT, 5,000V RANGE AC

CAUTION

DANGER!!! Do not touch circuit or instrument or test leads with power on!!

1. To use the 5,000 volt range, connect the grey test lead to the "COMMON-" Jack, and the red test lead to the "5,000V" jack. Turn the Range Selector Switch to the 5,000V position.

2. Set the function Switch to AC.

3. Be sure power is off in the circuit to be measured and all capacitors have been discharged:

Connect the grey test lead to the low voltage side of the voltage to be measured, and the red lead to the high voltage side.

4. Turn on the power in the circuit. Do **NOT** touch the instrument or test leads. The instrument will read the R.M.S. value of a sinusoidal wave form AC voltage.

5. Read the voltage on the scale arc marked "VA AC-DC". Use the 0-50 numbers. Multiply the reading by 100.

6. Turn off the power before disconnecting the test leads.

III. H. AC CURRENT MEASUREMENT 0.5mA RANGE, TO 5A RANGE.

1. Connect the grey test lead to the "COMMON-" jack, and the red test lead to the "AC/DC" jack.

2. Select the desired AC current range from the high range of 5A, down to the low range of 0.5mA.

CAUTION

Connect the 256, when used as a current measuring instrument, in series with the load. DO NOT connect it to a voltage source, because such a connection could deliver excessive current to the 256.

CAUTION

If high voltage is present in the circuit, turn power OFF while attaching test leads.

3. Connect the grey test lead and the red lead to the circuit to be measured.

4. Set the function switch to AC.

5. Turn on the power in the circuit to be tested. The instrument will read the R.M.S. value of a sinusoidal wave form AC current.

6. Read the current on the arc marked "VA, AC-DC". For the 10mA, and 1A ranges, use the 0-100 numbers on the arc.

7. For the 0.5mA 0.05A and 5A ranges use the 0-50 numbers on the arc.

8. For the 2.5mA and 0.25A use the 0-25 numbers on the arc.

9. Use suitable multipliers for each range, as required.

III. I. OUTPUT VOLTAGE MEASUREMENT, 10V, 25V, 100V, AND 250V RANGES.

1. In measuring the AC output voltage of an amplifier stage it is usual to find a DC voltage also present. The Simpson 256 is able to separately measure the AC signal voltage.

2. To measure the output voltage of an amplifier, where DC voltage is present, connect the test leads to the "COMMON-" and "uF" jacks. (See Section II, Para. M, and Fig. 2). The Simpson 256 has an internal DC blocking capacitor, rated at 750 volts. The combined signal and DC voltage should not exceed this 750 volt rating.

3. Select the desired AC voltage range. This selection is made by using the Range Selector Switch. Set the function switch to AC.

4. Read the output voltage on the scale arc marked "VA AC-DC".

5. For the 10V and 100V range use the 0-100 numbers on the arc.

6. For the 25V and the 250V ranges use the 0-25 numbers on the arc.

7. Use suitable multipliers for each range as required.

8. When no DC voltage is present the "COMMON-" and "AC/DC" jacks should be used.

9. The internal DC blocking capacitor causes errors. On the 100V range and 250V range, this effect is less than 1.5%, of additional error, at test signal frequencies greater than 60 HZ. On the 25V range the additional error is less than 1.5% at test frequencies greater than 200 HZ, and on the 10V range is less than 1.5% at test frequencies greater than 500 HZ.

10. To obtain higher accuracies, with DC blocking, than those shown in the preceeding paragraph 9, the user can make a special test arrangement. The use of a larger DC blocking capacitor externally to the 256 will produce greater accuracy. Connect the grey test lead to the "common-" jack. Connect a 2 MFD., 750V. paper capacitor to the "AC/DC" jack. Connect the red test lead to the other terminal of the 2 MFD. capacitor. Additional error will be less than 2% on the 10V, 25V, 100V, and 250V ranges, at test signal frequencies greater than 60 HZ.

III. J. RESISTANCE MEASUREMENT, Ω, KΩ x1, KΩ x10

1. Power for the Ω, KΩ x1, KΩ x10 scales is furnished by the internal battery.

2. Set the function switch to "Ω C."

3. To use the Ω (Ohm x 1) range, select the Ω range, and insert the test leads into the "common" and "Ω" jacks. Adjust the "zero Ω uF" knob for exactly full scale deflection of the pointer. Read resistance directly on the scale marked "Ω".

4. When the measurements are completed, remove the test lead from the "Ω " socket, to prevent needless battery drain.

5. To use the KΩ x1, and KΩ x10 scale, select the desired range, and insert the test leads into the Jacks marked "COMMON-" and "AC/DC." To adjust the "zero - Ω - uF" knob, short the test leads, and set the pointer for full scale deflection. Read on the "KΩ, MΩ, uF" scale using the proper multiplier.

6. Weak batteries should be removed promptly to prevent damage from Battery leakage.

III. K. RESISTANCE, MΩ x1 DC

1. To use the MΩ x1 DC range, an external DC voltage supply is necessary. The voltage may be between 100 and 130 volts DC.

CAUTION

High voltage is used in this method. Take suitable safety precautions.

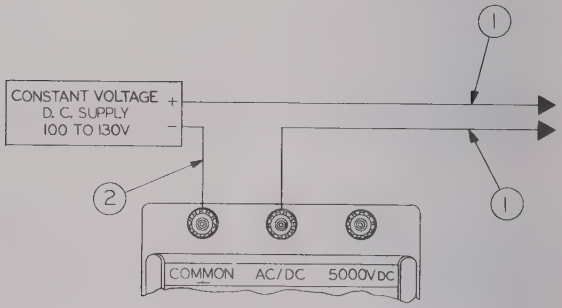
2. Turn Range Selector to "MΩ x1 DC".

   Set the function Switch to "Ω C".

   Arrange the power supply and test leads as shown in Fig. 4. Short the test leads and adjust the "Zero-Ω -uF" knob for full scale deflection. The preliminary adjustment is now completed. Read on the "MΩ " scale, multiplying by 10.

3. When using the MΩ x 1 DC range, a high DC voltage will be applied to the circuit or component being measured. In the case of very high resistance values this voltage will approach or equal the voltage of the power supply. DO NOT measure circuits or components whose voltage rating is less than the voltage of the power supply shown in Fig. 4.

   Polarity of some components will affect readings. As an example, an electrolytic capacitor must normally be connected with its positive terminal to the positive test lead.



1. TEST LEAD
2. CONNECTING WIRE

SUPPLY MUST HAVE GOOD REGULATION. FLUCTUATION WILL ALTER READINGS. LOAD CURRENT WILL BE LESS THAN 1 MA.

FIGURE 4. CONNECTIONS, M Ω x 1 D.C.

III. L. RESISTANCE, MΩ x1 AC

1. To use the MΩ x1-AC range, an external AC voltage supply is necessary. The voltage may be between 100 and 240 volts, AC at 60 HZ.

CAUTION

High voltage is used in this method. Take suitable safety precautions.

2. Turn Range Selector to "MΩ x1 AC".

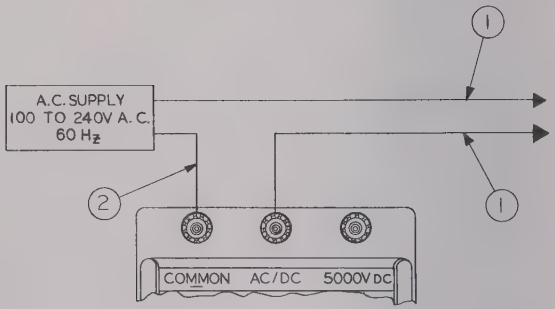
   Set the function Switch to "Ω C."

   Arrange the power supply and test leads as shown in Fig. 5. Short the test leads and adjust the "ZERO - Ω - uF." knob for full scale deflection. The preliminary adjustment is now completed. Read on "MΩ" scale.

3. When using the M x 1 AC range **do not** measure polarity sensitive components. A misleading reading will occur because of the polarity effects in electrolytic capacitors, and solid state items such as transistors. Voltage ratings of components or circuits under test must be greater than the value of the AC Voltage supply in Fig. 5.

   Resistors under test must be disconnected from any parallel capacitance.

   Passive devices, such as resistors, switches, etc. will not require any special attention, other than to voltage ratings.



1. TEST LEAD
2. CONNECTING WIRE

SUPPLY MUST HAVE GOOD REGULATION. FLUCTUATION WILL ALTER READINGS. LOAD CURRENT WILL BE LESS THAN 1 MA.

FIGURE 5. CONNECTIONS, MΩ x 1 A.C.

III. M. CAPACITY MEASUREMENT uFx0.1

1. To use the "uFx0.1" range, an external AC voltage supply is necessary. The voltage may be between 100 and 240 volts AC, at 60 HZ.

CAUTION

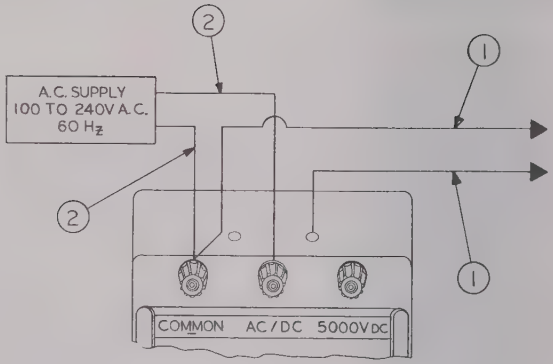
High voltage is used in this method. Take suitable safety precautions.

2. Turn range selector to "uFx0.1".

   Set the function switch to "Ω C."

   Arrange the power supply and test leads as shown in Fig. 6, and adjust the "zero - Ω - uF" knob for full scale deflection. The preliminary adjustment is now completed. Read on the "uF" scale, multiplying by 0.1.

3. This capacitance test must not be used for electrolytic capacitors. DO NOT measure components or circuits with voltage rating of less than the supply voltage in Fig. 6.



1. TEST LEAD
2. CONNECTING WIRE

SUPPLY MUST HAVE GOOD REGULATION. FLUCTUATION WILL ALTER READINGS. LOAD CURRENT WILL BE LESS THAN 1 MA.

FIGURE 6. CONNECTIONS, UF x 0.1

III. N. CAPACITY MEASUREMENT pFx100

1. To use the "pFx100" range, an external AC voltage supply is necessary. The voltage may be between 100 and 240 volts AC, at 60 HZ.

CAUTION

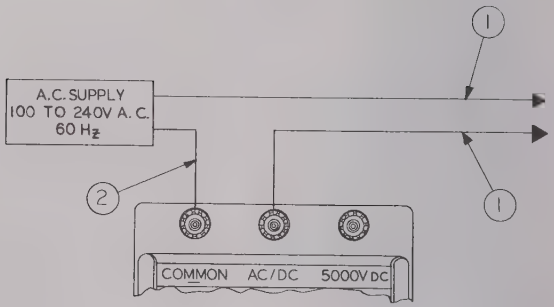
High voltage is used in this method. Take suitable safety precautions.

2. Turn range selector to "pFx100".

   Set the function Switch to "Ω C."

   Arrange the power supply and test leads as shown in Fig. 7, short the test leads, and adjust the "zero - Ω - uF" knob for full scale deflection. The preliminary adjustment is now completed. Read on the "pFx100" scale, multiplying by 100.

3. This capacitance test must not be used for electrolytic capacitors. DO NOT measure components or circuits with voltage rating of less than the supply voltage in Fig. 7.



1. TEST LEAD
2. CONNECTING WIRE

SUPPLY MUST HAVE GOOD REGULATION. FLUCTUATION WILL ALTER READINGS. LOAD CURRENT WILL BE LESS THAN 1 MA.

FIGURE 7. CONNECTIONS, pF x 100

III. O. DECIBEL SCALE

To use the DB scale measure the AC voltage of the signal as described in Section III E, or III I, and read on the DB scale.

The DB scale is calibrated in DB units, and referenced, (O DB) to a power level of 1 mw in a 600 Ω load. To use the DB scale measure the AC voltage of the audio signal as described in section III E, or III I. The DB scale is direct reading on the 2.5V.A.C. range. On other ranges add correcting factors.

Table 1

Range	DB Correction
0-0.5V	−14 DB
0-2.5V	none
0-10 V	+12 DB
0-25	+20 DB
0-100	+32 DB
0-250	+40 DB
0-500	+46 DB

These DB readings are for use when the voltage being measured is that found at a 600 Ω load value.

III. P. MEASURING COMPOSITE CURRENTS AND VOLTAGES

1. The Simpson 256 can be used for separately measuring the DC and AC components of composite currents and voltages. To avoid overloading the instrument, it is IMPORTANT that the SUM of the two components must not exceed the full scale value of the range selected.

2. Section III, I, describes "Output Voltage" measurement. In output voltage measurement where the "uf" jack is used DC voltage is blocked by an internal 0.1 uf, 750 volt capacitor. In Par. 10 of the "Output Voltage" measurement description, use of an external 2 uf., 750V. capacitor is specified. In these two cases, since the DC component is blocked, the limits of the preceeding paragraph do not apply.

3. Measuring the DC component.

   Set the function switch to DC, and select the current or voltage range desired. Proceed as described in Section III C, III D, or III E. The 256 will measure the DC component, in all current or voltage ranges.

4. Measuring the AC component.

   Set the function switch to AC, and select the current or voltage range desired. Proceed as described in Section III F, III G, or III H. The 256 will now measure the AC component and all current or voltage ranges. The instrument will read the RMS value of a sinusoidal waveform.

IV. MAINTAINANCE

1. The battery should be replaced promptly when it reaches the end of its useful life. Exhausted batteries may leak, and damage the tester, even though the battery is advertised as "Leakproof".

2. To replace the battery or fuse, remove the bottom cover.

3. The fuse is held in a fuse holder, and spare fuses are found in a storage compartment in the bottom of the case.

4. The fuse, part #5-113903, can be ordered from Simpson Electric Co., or Simpson Service Stations.

5. Replacement test leads can be purchased, under Simpson Catalog Number 07541.

6. Use Eveready No. E401 1.4 Volt Battery or equivalent.

Circuit diagram

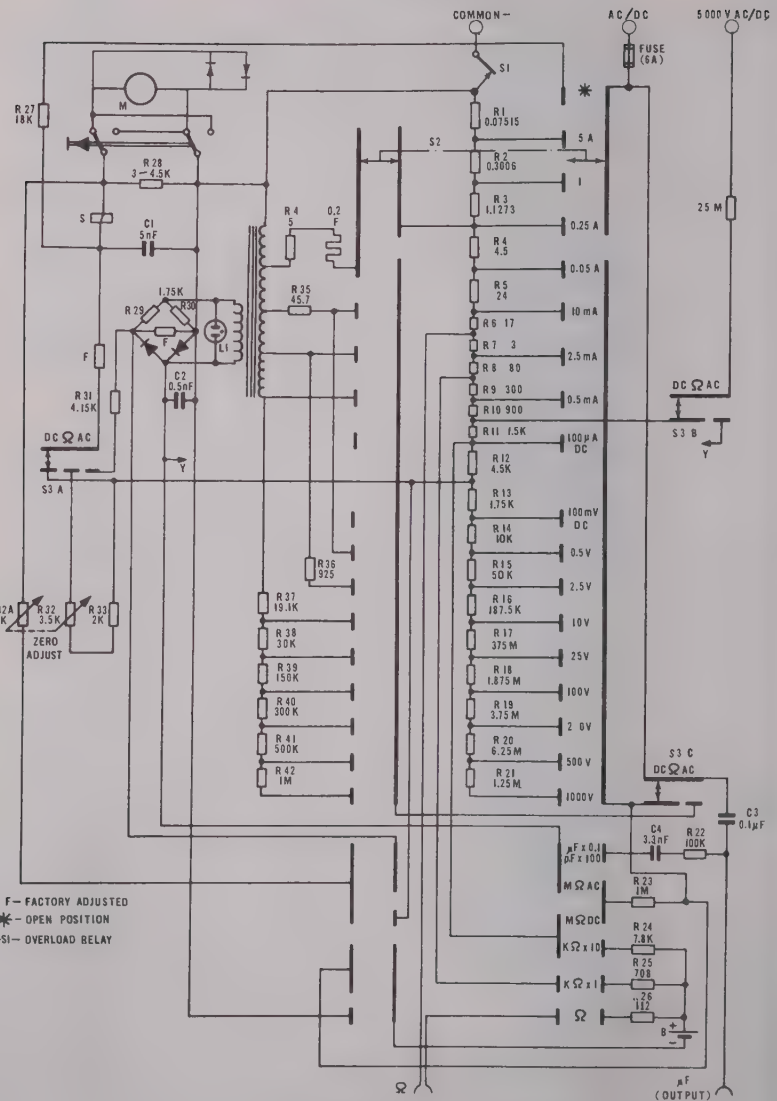


FIGURE 8. SCHEMATIC DIAGRAM

SIMPSON WARRANTY REPAIR STATIONS AND PARTS DEPOTS

Arizona, Phoenix 85034 Metermaster/Phoenix 2633 E. Buckeye Road	Area Code 602 273-7331
California, Glendale 91201 JSD Engineering Company 6915 San Fernando Road	Area Code 213 849-6187
California, Los Angeles 90022 Metermaster/Los Angeles Division of Kierulff Elec., Inc. 5646 Jillson St.	Area Code 213 685-4340
California, Los Angeles 90007 Quality Electric Division of Kierulff Elec., Inc. 3700 South Broadway	Area Code 213 232-3501
California, Mountain View 94041 Kierulff/Metermaster 2484 Middlefield Road	Area Code 415 968-6292
California, San Diego 92111 Metermaster/San Diego 8137 Engineer Road	Area Code 714 276-5202
California, San Francisco 94105 Pacific Electrical Instrument Lab. 111 Main Street	Area Code 415 421-7185
Canada, London, Ontario Bach-Simpson Ltd. 1255 Brydges Street P.O. Box 484	Area Code 519 451-9490
Colorado, Denver 80209 Metermaster Instrument Corporation 748 So. Broadway	Area Code 303 722-5766
Connecticut, Middletown Mancib Company Randolph Road—PO Box 467	Area Code 203 Diamond 7-5629

Connecticut, New Haven 06511 Kaufman Instrument Labs Inc. 810 Dixwell Avenue	Area Code 203 776-7201
Florida, Miami 33136 Florida Precision Instrument Corp. 800 N.W. 7th Avenue	Area Code 305 374-1731
Florida, Orlando 32806 Electro Tech Inc. 307 - 27th Street	Area Code 305 423-5589
Georgia, Hapeville 30054 Electro-Tech, Inc. 3020 Commerce Way	Area Code 404 758-7205
Hawaii, Honolulu 96817 Electronic Systems Inc. 1622-26 Silva Street	851-457 811-132
Illinois, Chicago 60625 (Niles) A & M Instrument, Incorporated 7800 N. Merrimac	Area Code 312 966-8100
Illinois, Chicago 60644 Pacific Indicator Company 5924 W. Madison Street	Area Code 312 261-1330
Illinois, Chicago 60644 Simpson Electric Company 5200 W. Kinzie Street	Area Code 312 379-1121
Kansas, Shawnee Mission 66205 Sturtz Instrument Co. 4705 Mission	Area Code 913 236-4705
Louisiana, New Orleans 70115 Industrial Instrument Works 3305 Tchoupitoulas Street	Area Code 504 895-5621
Maryland, Beltsville 20705 Meter Devices Inc. 11325 Maryland Ave.	Area Code 301 345-7775
Maryland, Timonium 21093 Edgerly Instrument Labs., Inc. 110 West Timonium Road	Area Code 301 252-1260
Massachusetts, Burlington 01803 The Mancib Co. Middlesex Turnpike at "A" St.	Area Code 617 272-9450

Massachusetts, Needham Heights 02194 Instruments, Incorporated 570 Hillside Avenue	Area Code 617 444-9410
Michigan, Detroit 48220 Ram Meter, Inc. 1100 Hilton Road Ferndale	Area Code 313 547-1000
Minnesota, Minneapolis 55411 Instrumentation Services Inc. 967 Winnetka	Area Code 612 544-8916
Missouri, St. Louis 63112 Scherrer Instruments 5449 Delmar Blvd.	Area Code 314 367-9800
New Jersey, Belleville 07109 Marshall Instruments, Inc. 236 Washington Avenue	Area Code 201 751-1190
New York, Buffalo 14216 Electrical Instrument Labs. 932 Hertel Avenue	Area Code 716 876-0880
N. Y., Great Neck, Long Island 11022 Simpson Instrument Sales & Service, Inc. 130 Cutter Mill Road	Area Code 212 683-0674 Area Code 516 482-3103
New York, Great Neck, L.I. 11022 A & M Instrument, Inc. Community Drive	Area Code 516 487-0500
New York, New York 10011 Electro-Tech Equipment Company 85 Tenth Avenue	Area Code 212 675-2400
New York, Syracuse 13215 Syracuse Instrument Lab. 4895 South Avenue Box 96	Area Code 315 492-1651
New York, Vestal 13850 Compton Industries Inc. 333 Vestal Parkway East P.O. Box 351	Area Code 607 748-3349

North Carolina, Charlotte 28214 Electro-Tech Inc. 5141 Belhaven Blvd.	Area Code 704 392-7451
Ohio, Cleveland 44135 Weschler Electric Company 4250 W. 130th Street	Area Code 216 251-4609
Ohio, Cleveland 44103 Pioneer-Standard Electronics, Inc. 5403 Prospect Avenue	Area Code 216 432-0010
Ohio, Dayton 45404 SREPCO Electronics Div. of Pioneer Standard Electronic, Inc. 314 Leo Street	Area Code 513 224-0871
Oregon, Portland 97217 Industrial Instrument Repair Lab. 1910 N. Killingsworth St.	Area Code 503 285-6629
Pennsylvania, Philadelphia 19115 Sunshine Scientific Instrument 1810 Grant Avenue	Area Code 215 673-5600
Texas, Dallas 75204 Ultra Instrument Lab., Inc. 3515 Swiss Avenue, Suite 117	Area Code 214 826-6395 826-6396
Washington, Seattle 98119 The Instrument Lab. Inc. 934 Elliott Avenue West	Area Code 206 283-5850
Wisconsin, Milwaukee 53202 The Electro-Mechano Company 261 East Erie Street	Area Code 414 272-4050

Warranty

SIMPSON ELECTRIC COMPANY warrants each instrument and other articles of equipment manufactured by it to be free from defects in material and workmanship under normal use and service, its obligation under this warranty being limited to making good at its factory any instrument or other article of equipment which shall within 90 days after delivery of such instrument or other article of equipment to the original purchaser be returned intact to it, or to one of its authorized service stations, with transportation charges prepaid, and which its examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties expressed or implied and of all other obligations or liabilities on its part, and SIMPSON ELECTRIC COMPANY neither assumes nor authorizes any other persons to assume for it any other liability in connection with the sale of its products.

This warranty shall not apply to any instrument or other article of equipment which shall have been repaired or altered outside the SIMPSON ELECTRIC COMPANY factory or authorized service stations, nor which has been subject to misuse, negligence or accident, incorrect wiring by others, or installation or use not in accord with instructions furnished by the manufacturer.

Simpson ELECTRIC COMPANY
5200 W. Kinzie Street, Chicago, Illinois 60644 Phone: (312) 379-1121
Export Dept: 400 W. Madison Street, Chicago, Illinois 60606, Cable, Simelco
IN CANADA: Bach-Simpson Ltd., London, Ontario
IN INDIA: Ruttonsha-Simpson Private Ltd., International House, Bombay-Agra Road, Vikhroli, Bombay
AGM DIVISION

Quality is the indispensable component of every Simpson instrument . . . . . .